

Cutting equipment remotely operated in a hostile environment

Retention treatment equipment to drain and dismantle the internals of a sodium reactor

A complete range of cutting equipment which can be used to access every point in the reactor inaccessible for humans, to drain the sodium from the reactor as part of dismantling.

Challenge

Dismantling a sodium reactor involves releasing mass of sodium retained by the internal structure, which cannot be drained and are sometimes very difficult to access. The temperature, sodium, irradiation, and need to maintain reactor sealing are all limitations which must be considered for the success of these operations.

The tools implemented must be used for precise and quick cutting, allowing the flow of the liquid sodium towards pumping devices, or releasing structures in order to remove them from the reactor.

Solution

Framatome has developed a full range of equipment in order to integrate these aspects and ensure precise, effective and quick cutting:

- Mechanical drilling compatible with sodium and through several successive plates
- Laser cutting systems permitting cutting in contact with or at a distance of several metres, with no forces transmitted between the parts or the plates with a thickness of several dozen millimetres

Framatome can also propose robotic carriers, which can bring the cutting tool near to the structures for precise and controlled cutting:

- Robotic rods compatible with existing access: slab penetration, mobile plugs, handling hood, etc.
- Robotic trolleys able to access difficult-to-reach locations and move independently over several dozen metres.

The integration of cutting tools in an independent equipment with instrumentation and control, viewing systems, qualification and maintenance equipment leads to a reliable and independent solution, compatible with the working environment.



Laser cutting robot successfully used at Super-Phenix

Customer benefits

Controlled and tested technologies: successful implementation by Framatome on an industrial scale for the Super-Phenix reactor at Creys-Malville.

Existing tools or equipment, off the shelf or can be adapted to the particularities of your operations if necessary.

Framatome can propose a customized solution to successfully manage all stages of your project:

- Analysis of the problem and definition of a suitable technological solution
- Design, manufacture and qualification of an integrated ready-to-use system
- On-site testing and deployment

Your performance is our everyday commitment

Technical information

Performances compatible with all configurations

Mechanical drilling of the internals of reactors containing sodium:

- Hole diameter up to 50 mm in plates with a thickness of up to 50 mm
- Possibility to drill several successive plates
- Temperature of up to 200°C and under 15 m of liquid sodium

Laser cutting of the internals of gas reactors

- Thickness cut up to 80 mm
- Cutting in contact and at a distance of up to 1m.
- No return forces
- Temperature up to 60 °C
- Linear or orbital cutting, possibility to cut parts in a wide range of shapes (plates, solid parts, bellows, tubes, etc.)



Inspection and orbital laser cutting rod able to cut tubes and plates up to a distance of one meter



Recovery of drilling chips

Drilling of the Super-Phenix corium recovery system under 15 m of liquid sodium



Drilling machine used for Super-Phenix

Key figures

- **Several** technologies implemented to drill steel pieces up to 100 mm thick
- Over **100** cuts for the Super-Phenix, allowing the reactor to be safely filled with water in **2017**.
- Orbital laser technology with reduced dimensions (**diameter <100 mm**)

References

EDF Creys-Malville reactor (Super-Phenix):

- Drilling of the corium recovery platforms before draining the sodium and unloading the core
- Laser cutting of the sodium retentions of the diagrid
- Laser cutting of the slab penetrations

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